

APPLICATION FOR UNITED STATES LETTERS PATENT

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TITLE:

PACKING CASE FOR A LARGE-CALIBER CARTRIDGE

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## CROSS REFERENCE TO RELATED APPLICATION

[0001] This application claims the priority of German Patent Application, DE 102 49 966.7 filed October 26, 2002 and which is incorporated herein by reference.

## BACKGROUND OF THE INVENTION

[0002] The invention relates to a packing case for a large-caliber cartridge, comprising a thin-walled cartridge case and a projectile that protrudes at least partially from the front of the cartridge case and has an annular stop groove at its outer circumference.

[0003] German published Patent Application No. DE 100 61 068 A1 discloses a packing case having an outer case, which can be closed at the front and the rear by a lid, and includes an inner case that receives the cartridge and is disposed inside the outer case. The inner case comprises at least two assemblies that are disposed one behind the other in the direction of the longitudinal axis of the packing case. The first assembly is permanently attached to the front end of the outer case. On its side facing the first assembly, the second

assembly of the inner case has a receptacle that is provided with radially elastic clamping elements and can be displaced longitudinally between a first and a second end position inside the outer case such that, in the first end position, a guide part associated with the first assembly presses the clamping elements inward, behind a support edge of the projectile located in the packing case, and the elements remain fixed in this position; in the second end position, the clamping elements can be spread out against the wall of the outer case, so the cartridge can be removed from the packing case.

[0004] Unlike other known packing cases, this packing case has the advantage that the inner packing need not be completely withdrawn from the outer case in order to remove the cartridge, so the individual parts need not be re-inserted into the outer case, which is a time-consuming process, after the cartridge has been removed. The mechanism for actuating the clamping elements of the projectile, however, is relatively expensive. Moreover, embodying a corresponding support edge on the projectile as a possible predetermined fracture point is undesirable, and may adversely affect the flight behavior of the projectile.

## SUMMARY OF THE INVENTION

[0005] It is the object of the invention to provide a packing case for a large-caliber cartridge, in which the inner case need only be partially pulled out of the outer case for removing the cartridge, on the one hand, and the mechanism for actuating the fixing elements of the projectile has the simplest possible embodiment, on the other hand, without negatively affecting the function of the elements.

[0006] In accordance with the invention, this object generally is by a packing case for a large-caliber cartridge, which has a thin-walled cartridge casing and a projectile that projects at least partially from the front of the cartridge casing, and has an annular stop groove at its outer circumference, with the packing case comprising: an outer case that can be closed at the front and the rear, and an inner case that receives the cartridge and is inside the outer case, with the inner case including at least two partial cases that are disposed one behind the other in the direction of the longitudinal axis of the packing case; at least two spring-loaded stop elements that can pivot about a shaft extending parallel to the longitudinal axis of the packing case disposed between adjacent end surfaces of the two partial cases, and, in a locked position, extend

with a form-fit into the stop groove of a projectile located in the packing case, thereby being supported at the rear against the end surface of the rear partial case; and the stop elements each have a guide element that is supported against a respective guide groove such that, when the inner case is pulled out of the outer case, the guide elements rotate relative to the guide grooves by a maximum angle of rotation; and the stop elements are pivoted outward from their locked position into an unlocked position. Further, particularly advantageous, embodiments of the invention are disclosed.

[0007] The invention is essentially based on the concept of providing a multiple-part inner case, and at least two spring-loaded stop elements that can be pivoted toward the projectile and are provided with guide elements, for securing the cartridge located in the packing case. In their locked position, the stop elements extend into a corresponding stop groove in a form-fit, and are seated in a partial case of the inner case at the rear. For the respective cartridge to be removable from the packing case, when the cartridge is pulled out, the stop elements and the guide elements are rotated together relative to radially extending guide grooves on which the guide elements are supported, so the stop elements are

pivoted radially outward from the stop groove into their unlocked position.

[0008] In one embodiment of the invention, the inner case includes three partial cases, which are disposed one behind the other in the direction of its longitudinal axis. The front, first partial case is attached to the outer case, and the adjoining second and third partial cases are connected to one another so as to co-rotate, and are disposed to be axially displaced in the outer case. At least two guide rails are secured, with equidistant spacing over the circumference, to the outside of the first partial case. The rails extend in the longitudinal direction up to the third partial case, and have inward-oriented radial cams, which extend into corresponding radial grooves of the second partial case such that, when the second and third partial cases are displaced axially from a first end position, in which the inner case is completely inside the outer case, and into a second end position, in which the inner case is partially pulled out of the outer case, the second partial case rotates by a maximum preset angle of rotation relative to the third partial case, which is fixed against rotating inside the outer case, so the stop elements disposed at the edge between the second and third partial cases

are pivoted from their locked position into their unlocked position.

[0009] It has proven advantageous for four stop elements, as well as four guide rails, to be provided with equidistant spacing over the circumference, with the guide rails being seated in axial grooves on the surface of the partial cases and the spacing between the side walls of the grooves on the surface of the second partial case is selected such that the guides act as stops for securing the initial and open positions of the second partial case.

[0010] In a further embodiment of the invention, the second and third partial cases are connected to one another via a multi-part connecting ring, which accommodates the radial guide grooves into which the guide elements of the stop elements, which are preferably formed as cams, extend. The respective radial guide groove is disposed in a hook-shaped part at the end of a lever that is connected to the connecting ring. The guide element of the respective stop element is supported on the side wall of the hook-shaped part that faces the connecting ring.

[0011] Further details about and advantages of the invention ensue from the exemplary embodiments explained below in conjunction with figures.

## BRIEF DESCRIPTION OF THE DRAWINGS

[0012] Fig. 1 is a longitudinal section through a packing case in accordance with the invention, the case comprising an inner case that receives a large-caliber cartridge, which is secured in its position by stop elements.

[0013] Fig. 2 is an enlarged representation of a cross-section through the packing case shown in Fig. 1, along the section line II - II.

[0014] Fig. 3 is a perspective view of the inner case.

[0015] Fig. 4 is an enlarged, perspective view of the inner case in the region of a stop element, with the second partial case being omitted.

[0016] Fig. 5 is a longitudinal section that corresponds to Fig. 1, with the cartridge being drawn slightly out of the packing case and no longer secured by the stop elements.

[0017] Fig. 6 is an enlarged representation of a cross-section through the packing case shown in Fig. 5, along the section line VI - VI.



## DETAILED DESCRIPTION OF THE INVENTION

[0018] Figs. 1 and 5 show a packing case 1 according to the invention for a large-caliber cartridge 2, which has a thin-walled cartridge case 3 and a projectile 4 that projects at least partially out of the front of the cartridge case 3. At its outer circumference, the projectile 4 has an annular stop groove 5 (Figs. 2, 4 and 6).

[0019] The packing case 1 has a metal outer case 6, which is closed at the front and can be closed at the rear by a lid, not shown, and an inner, multi-part case 7, which receives the cartridge 2 and is disposed inside the outer case 6. The inner case 7 essentially comprises three partial cases 9 through 11 that are disposed one behind the other in the direction of its longitudinal axis 8. The front (first) partial case 9 is permanently attached to the outer case 6 at the front, and receives the tip region of the projectile part 4 of the cartridge 2 projecting from the cartridge casing 3.

[0020] The adjoining second and third partial cases 10 and 11 are connected to one another, so as to rotate, by a four-part connecting ring 12 (Figs. 3 and 4), and are disposed to be axially displaceable in the outer case 6. The second partial

case 10 receives the projectile part located between the cartridge casing 3 and the first partial case 9.

[0021] Four guide rails 13 are secured to the outer circumference of the first partial case 9 with equidistant spacing (See Fig. 3, and extend in the longitudinal direction to the third partial case 11 where they are likewise secured. In the region of the second partial case 10, the guide rails 13 have respective inward-oriented cams 14, which extend into corresponding inclined grooves 15 in the surface of the second partial case 10 (for the sake of a clear overview, in Fig. 3 the upper guide rail is omitted, making the grooves 15 visible) such that, when the second and third partial cases 10, 11 are displaced axially from a first end position, in which the inner case 7 is completely inside the outer case 6 (Fig. 1), into a second end position, in which the inner case 7 is partially pulled out (e.g. by 50 mm) of the outer case 6 (Fig. 5), the second partial case 10 rotates by a maximum preset angle of rotation, for example of 10°, relative to the third partial case 11 which is held against relative rotation in the outer case 6 via the guide rails connected to the first partial case 9.

[0022] The guide rails 13 are seated in respective grooves 16 on the outer surface of the partial casing 9-11, with each guide

rail 13 being in a form-fit with the groove side walls in the region of the first and third partial cases 9 and 11, and the connecting ring 12 being in a form-fit with the side walls of the grooves 16. In contrast, in the region of the second partial case 10, the spacing between the side walls 17, 18 of the grooves 16 is selected such that they limit the rotation of the second partial case 10 with respect to the third partial case 11, and serve as end stops.

[0023] As shown in Figs. 4 and 6, four spring-loaded stop elements 19, whose rotating shafts 20 are seated in the end wall of the second partial case 10, are provided at the edge between the second and third partial cases 10 and 11. These stop elements 19 each rotates about a respective axis that extends parallel to the longitudinal axis 8 of the packing case 1.

[0024] In the locked position shown in Figs. 1 through 4, the stop elements 19 are pressed by respective springs, not shown, into the stop groove 5 of the projectile 4 located in the packing case 1, and are held there in a form-fit.

[0025] A respective guide element 21 formed as a cam is provided at the free ends of the stop elements 19 spaced from the rotating shafts 20. Each guide element 21 extends into an approximately radially extending guide groove (or surface) 22

provided in a hook-shaped part 23 disposed at the end of a lever 24 connected to the connecting ring 12. The guide element 21 of a respective stop element 19 is supported against the side wall 25 of the hook-shaped part 23 facing the connecting ring 12 (See Figs. 2, 4 and 6).

[0026] The intended use of the packing case 1 according to the invention is described in detail below.

[0027] After the lid, not shown, that closes the rear of the packing case 1 has been removed, the cartridge 2 to be inserted is pushed into the inner case 7. In the process, the stop elements 19 are pivoted outward, counter to the pressure of corresponding springs by the projectile. As soon as the cartridge 2 impacts the stop surfaces of the first partial case 9 at the front, the stop groove 5 of the projectile 4 is located beneath the stop elements 19, so the stop elements 19 are pressed into the stop groove 5 by the springs, which are not shown. The cartridge 2 is therefore locked in a form-fit (Figs. 1 through 4). The springs prevent an undesired pivoting of the stop elements 19 out of the locked position.

[0028] If the packing case 1 falls in the direction of the cartridge floor 26, the form-fit connection diverts the stress from the projectile 4 into the third partial case 11, which protects the cartridge casing 3. If the packing case 1 falls

in the direction of the projectile tip of the cartridge 2, the projectile 4 is supported with its stop edge against the first partial case 9, and the cartridge casing 3 is supported by the second partial case 10 and against the first partial case 9.

[0029] If the cartridge 2 is to be removed from the packing case 1, after a corresponding lid has been removed, the third partial case 11, and thus the second partial case and the cartridge 2, are pulled about 50 mm out of the outer case 6, for example with a guide loop, not shown (Figs. 5 and 6). In the process, the second partial case 10 is rotated by 10° relative to the connecting ring 12 by the radial cams 14 secured to the guide rails 13 and extending into the angled (or inclined) radial grooves 15 of the second partial case 10. The stop elements 19 co-rotate with the second partial case 10, so the guide element 21 of each respective stop element 19 slides outward at the side wall 25 of the hook-shaped part 23, the wall being formed as a radial surface, and the stop element 19 is pulled outward counter to the pressure of its associated spring. The cartridge 2 is thereby released, and can be removed by the inner case 7.

[0030] Of course, the invention is not limited to the above-described embodiment. For example, more or fewer than four stop elements 19 or guide rails 13 can be employed.

[0031]        Instead of being effected by the spacing between the side walls of the guide rails/grooves in the second partial case, the end stops for limiting the rotation of the stop elements with respect to the radial guide grooves can be effected by the length of the radial grooves into which the radial cams of the guide rails extend.

[0032]        It is not absolutely necessary to provide a hook-shaped lever end for forming the radial guide grooves. Instead, the guide grooves can also be provided directly in a connecting ring.

[0033]        The invention now being fully described, it will be apparent to one of ordinary skill in the art that many changes and modifications can be made thereto without departing from the spirit or scope of the invention as set forth herein.